



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.02.2020 Bulletin 2020/06

(51) Int Cl.:
F21S 45/00 ^(2018.01) **B60Q 1/00** ^(2006.01)

(21) Application number: **18382575.1**

(22) Date of filing: **31.07.2018**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

- **RUBIA, Juan-Antonio**
23600 Martos (ES)
- **GUZMAN, Alfonso-Manuel**
23600 Martos (ES)
- **MARTINEZ, Francisco**
23600 Martos (ES)
- **MEDINA, Manuel-Jesus**
23600 Martos (ES)
- **RAMA, Beatriz**
23600 Martos (ES)

(71) Applicant: **Valeo Iluminacion**
23600 Martos (ES)

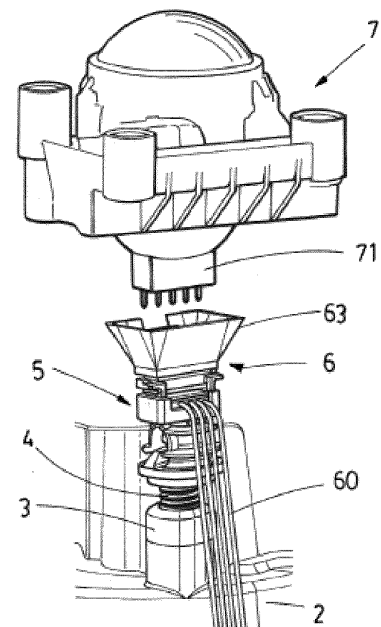
(72) Inventors:
• **TEBA, Daniel**
23600 Martos (ES)

(74) Representative: **Valeo Vision**
IP Department
34, rue Saint André
93012 Bobigny (FR)

(54) **METHOD FOR MANUFACTURING AN AUTOMOTIVE LUMINOUS DEVICE**

(57) The invention provides a method for manufacturing an automotive luminous device (1). This method comprises some steps. A first step comprises providing a housing (2) with a hollow protrusion (3). A second step comprises providing an auxiliary element (4) in the hollow protrusion (3). A third step comprises providing a connector receptacle (5) in connection with the auxiliary element (4). A fourth step comprises inserting a matching connector (6) in the connector receptacle (5) in a detachable way, the matching connector (6) further comprising guiding means (63). A fifth step comprises placing a luminous module (7) comprising a module connector (71), the module connector (71) being helped by the guiding means (63) to be connected to the matching connector (6), thus achieving an electric connection between the module connector (71) and the matching connector (6). A final step comprises moving the connector receptacle (5) so that the matching connector (6) exits from the connector receptacle (5).

FIG.5



Description

TECHNICAL FIELD

[0001] This invention is related to the field of the manufacturing of automotive luminous devices, and more specifically to the positioning of luminous modules on a luminous device housing.

STATE OF THE ART

[0002] Vehicles luminous devices require an increasing number of electric connections to perform new functions, providing a safer and advanced performance.

[0003] A harness of wires is used to make information and electric supply reach each one of the light sources of the luminous device. This harness is distributed in different bundles throughout the housing, because luminous modules must be located in specific positions to fulfil strict regulations.

[0004] Each one of these wires bundles ends with an electrical connector, which is electrically coupled to the luminous module. However, these wires bundles are loose and, since the assembly of the luminous devices is made manually, with reduced visibility and accessibility, the final layout of these bundles after connecting the luminous module is uncertain. This may be dangerous and impact the correct operation of the luminous device.

[0005] Further, current luminous modules sometimes request freedom to rotate or pivot, so these connections cannot be excessively tight.

DESCRIPTION OF THE INVENTION

[0006] The invention provides a solution for this problem by means of method for manufacturing a luminous device according to claim 1. Preferred embodiments of the invention are defined in dependent claims.

[0007] Unless otherwise defined, all terms (including technical and scientific terms) used herein are to be interpreted as is customary in the art. It will be further understood that terms in common usage should also be interpreted as is customary in the relevant art and not in an idealised or overly formal sense unless expressly so defined herein.

[0008] In this text, the term "comprises" and its derivations (such as "comprising", etc.) should not be understood in an excluding sense, that is, these terms should not be interpreted as excluding the possibility that what is described and defined may include further elements, steps, etc.

[0009] In a first inventive aspect, the invention provides a method for manufacturing an automotive luminous device, the method comprising the steps of providing a housing with a hollow protrusion; providing an auxiliary element in the hollow protrusion; providing a connector receptacle in connection with the auxiliary element, so that the connector receptacle has

a rotational degree of freedom with respect to the auxiliary element, but has no linear degree of freedom with respect to the auxiliary element;

inserting a matching connector in the connector receptacle in a detachable way, the matching connector further comprising guiding means;

placing a luminous module comprising a module connector, the module connector being helped by the guiding means to be connected to the matching connector, thus achieving an electric connection between the module connector and the matching connector;

moving the connector receptacle so that the matching connector exits from the connector receptacle.

[0010] The connector receptacle is connected to the auxiliary element in such a way that the connector receptacle may rotate with respect to the auxiliary element, but may not displace linearly, unless a high separation force is applied. As a result, when the matching connector is inserted in the connector receptacle, the guiding means of the matching connector have a rotational degree of freedom with respect to the housing, so that these guiding means adapt to the position of the module connector while the lighting module approaches the housing for its assembly.

[0011] This method allows a semiautomatic electrical connection between the lighting module and the matching connection, which is previously pre-positioned to the housing in an earlier manufacturing step. The lighting module is safely connected and then the auxiliary elements used to achieve this connection are moved away so that the module connector and the matching connector are freed.

[0012] In some particular embodiments, the luminous module further comprises a mechanical connector which is connected to the housing while the module connector is connected to the matching connector.

[0013] This simultaneous connection is particularly advantageous, since in the same step as the mechanical connection is achieved, electrical connection is also finished, and the movement of the auxiliary elements frees the lighting module so that the module installation is completed.

[0014] In some particular embodiments, the luminous module further comprises a mechanical connector which is connected to an aiming system of the housing while the module connector is connected to the matching connector.

[0015] The use of an aiming system is particularly advantageous, since it may locate the connection point far from the housing, in a location where this connection may be more convenient for the manufacturing process.

[0016] In some particular embodiments, the hollow protrusion is internally threaded, and the step of moving the connector receptacle includes screwing the auxiliary element into the hollow protrusion, so that the connector receptacle moves away from the matching connector.

[0017] The auxiliary element and the connector receptacle are engaged and form an assembly which a rota-

tional degree of freedom. As a consequence, when the auxiliary element is screwed into the hollow protrusion, the connector receptacle also moves with it, and leaves the matching connector in connection with the module connector.

[0018] In some particular embodiments, the hollow protrusion is a through hole so that it is accessible from both sides, and the step of screwing the auxiliary element is made from the side opposite from the connection between the auxiliary element and the connector receptacle.

[0019] The screwing of the auxiliary element may be performed in many ways. One of them is accessing it from a side opposite to the side where the auxiliary element is provided inside the hollow protrusion. This is a good solution, since the through hole is closed by the auxiliary element itself and this auxiliary element, despite being screwed, remains as a watertight sealing for this through hole.

[0020] In some particular embodiments, the hollow protrusion is configured to allow the displacement of the auxiliary element inside the hollow protrusion but offering resistance to the movement, so that the resistance keeps the auxiliary element in place until the step of moving the connector receptacle, when an external force overcomes the resistance and moves the auxiliary element inside the hollow protrusion so that the matching connector exits from the connector receptacle.

[0021] In these embodiments, the auxiliary element is configured to slide along the inner surface of the hollow protrusion. In a first step, the auxiliary element is merely deposited inside the hollow protrusion, and the rest of elements (the connector receptacle and the matching connector) are successively placed on it. Due to the resistive force, the auxiliary element supports these elements without moving. In a further step, the auxiliary element is forced to move further inside the hollow protrusion so that the connector receptacle disengages from the matching connector.

[0022] In some particular embodiments, the auxiliary element and the connector receptacle comprise a ball joint and a ball socket, so that the connection between the auxiliary element and the connector receptacle has a rotational degree of freedom.

[0023] The auxiliary element and the connection receptacle have a mutual engagement which allows the connector receptacle move with a rotational degree of freedom with respect to the auxiliary element, but has no linear degree of freedom. This ball joint-socket arrangement is a good option to achieve this connection. One of the auxiliary element or the connector receptacle comprises the ball joint and the other one comprises the ball socket. In preferred embodiments, the auxiliary element comprises the ball joint and the connection receptacle comprises the ball socket.

[0024] In some particular embodiments, the matching connector comprises a first region intended to cooperate with the connector receptacle and a second

region comprising the guiding means, and the first region of the matching connector and the connector receptacle comprise a rectangular protrusion and a rectangular housing, so that the insertion between the matching connector and the connector receptacle may only be assembled and disassembled in a single direction.

[0025] This way of inserting the matching connector into the connector receptacle in a detachable way is advantageous, since after this insertion, the matching connector is safely engaged to the auxiliary element with a rotational degree of freedom, waiting for the module connector to be connected to it.

[0026] In some particular embodiments, the rectangular housing comprises a recess for connecting cables from the matching connector to pass.

[0027] The matching connector is electrically connected to the main electrical connection of the housing in a previous step. The cables that perform this connection are conducted in a controlled way from the matching connector to this main electrical connection due to the recess.

[0028] In some particular embodiments, the guiding means comprise a funnel shaped guide adapted to guide the module connector towards the matching connector.

[0029] This funnel shaped guide comprised in the matching connector helps the module connector to arrive at the matching connector while the luminous module is being installed in the housing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] To complete the description and in order to provide for a better understanding of the invention, a set of drawings is provided. Said drawings form an integral part of the description and illustrate an embodiment of the invention, which should not be interpreted as restricting the scope of the invention, but just as an example of how the invention can be carried out. The drawings comprise the following figures:

Figure 1a shows a first step of a particular embodiment of a method for manufacturing an automotive luminous device according to the invention.

Figure 1b shows a first step of a different embodiment of a method for manufacturing an automotive luminous device according to the invention.

Figure 2 shows a second step of the method illustrated in Figure 1a.

Figure 3 represents a third step of this method.

Figure 4 represents a fourth step of this method.

Figure 5 represents a fifth step of this method.

Figure 6 represents a farther perspective of this fifth step.

Figure 7 represents a final step of this method.

DETAILED DESCRIPTION OF THE INVENTION

[0031] The example embodiments are described in sufficient detail to enable those of ordinary skill in the art to embody and implement the systems and processes herein described. It is important to understand that embodiments can be provided in many alternate forms and should not be construed as limited to the examples set forth herein.

[0032] Accordingly, while embodiment can be modified in various ways and take on various alternative forms, specific embodiments thereof are shown in the drawings and described in detail below as examples. There is no intent to limit to the particular forms disclosed. On the contrary, all modifications, equivalents, and alternatives falling within the scope of the appended claims should be included. Elements of the example embodiments are consistently denoted by the same reference numerals throughout the drawings and detailed description where appropriate.

[0033] Figure 1a shows a first step of a particular embodiment of a method for manufacturing an automotive luminous device according to the invention.

[0034] In this figure, a housing 2 is provided with a hollow protrusion 3. This hollow protrusion has some means to retain an element which is inserted in it. In this figure 1a, this means comprise a threaded inner surface 30.

[0035] Figure 1b shows a first step of a different embodiment of a method for manufacturing an automotive luminous device according to the invention.

[0036] In this figure, the housing 2 is also provided with a hollow protrusion 3, and this hollow protrusion has some means to retain an element which is inserted in it. However, in this figure 1b, this means comprise a rubber inner surface 31.

[0037] Figure 2 shows a second step of a particular embodiment of a method for manufacturing an automotive luminous device according to the invention.

[0038] This figure represents a method which uses the housing of figure 1a. In this figure, an auxiliary element 4 is placed in the hollow protrusion 3. Since the hollow protrusion 3 has an inner threaded surface, the auxiliary element 4, which is intended to match this threaded surface, comprises a complementary threaded surface 40.

[0039] This auxiliary element also comprises a ball joint 41, which is accessible after the auxiliary element has been introduced into the hollow protrusion.

[0040] Figure 3 represents a third step of this method. In this figure, a connector receptacle 5 is engaged to the auxiliary element by means of a ball socket 51 which is connected to the ball joint (covered by the ball socket) of the auxiliary element 4. As a consequence, the connector receptacle has a rotational degree of freedom with re-

spect to the auxiliary element, but has no linear degree of freedom with respect to the auxiliary element. As may be obvious, in different embodiments, the ball socket is part of the auxiliary element and the ball joint is part of the connector receptacle.

[0041] Figure 4 represents a fourth step of this method. In this figure, a matching connector 6 is inserted in the connector receptacle 5. The connector receptacle 5 comprises a recess 52 so that the connecting cables 60 from the matching connector 6 may pass through the recess 52 and then reach the main connector of the housing.

[0042] The matching connector 6 comprises a first region 61 intended to cooperate with the connector receptacle 5 and a second region 62 comprising the funnel guide 63. This first region 61 comprises a rectangular protrusion 64 and the connector receptacle 5 comprises a rectangular housing 53, so that the insertion between the matching connector and the connector receptacle may only be assembled and disassembled in a single direction.

[0043] The matching connector 6 is therefore inserted in the connector receptacle 5 in a detachable way, but with a single linear degree of freedom, since these elements may only be separated in the same direction of insertion. Due to this connection, the matching connector has a rotational degree of freedom with respect to the auxiliary element, and therefore with respect to the housing.

[0044] Figure 5 represents a fifth step of this method. A luminous module 7 with a module connector 71 approaches the matching connector 6. The module connector 71 is guided by the funnel guide 63 to be coupled to the matching connector 6, thus achieving an electric connection between the module connector 71 and the matching connector 6.

[0045] Figure 6 represents a farther perspective of this fifth step, showing the automotive luminous device 1. The luminous module 7 is approaching at the same time the matching connector 6 and some aiming means 21 located in the housing. As a consequence, in a single coupling step, the mechanical connector 8 of the luminous module 7 is mechanically coupled to the aiming system 21 of the housing 2 and the module connector 71 is also electrically coupled to the matching connector 6, which also belongs to the housing 2. This single step is automatic and saves human intervention, while keeps the connecting cables 60 safe from being tangled or trapped, since they do not move during this assembly step.

[0046] Figure 7 represents a final step of this method. The auxiliary element is screwed into the hollow protrusion 3 (so it is not seen). As a consequence, the rectangular housing 53 of the connector receptacle 5, which is engaged to the auxiliary element, also descends, being disengaged from the matching connector 6, which remains coupled to the module connector 71 since the force which couples both connectors is stronger than the mere insertion of a rectangular element inside a rectangular housing. As a consequence, the luminous module 7 re-

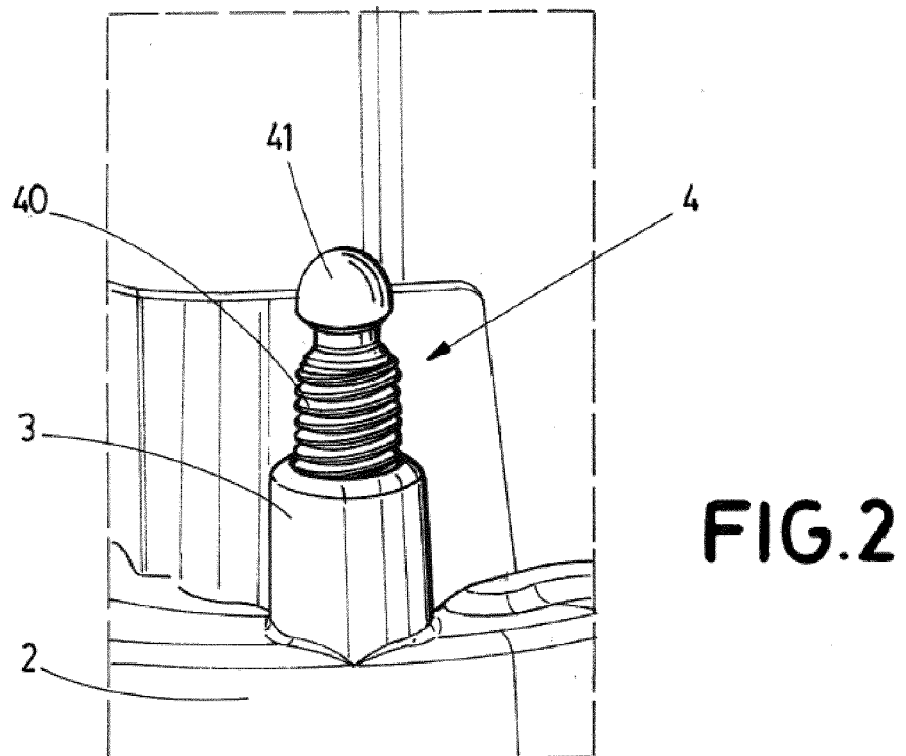
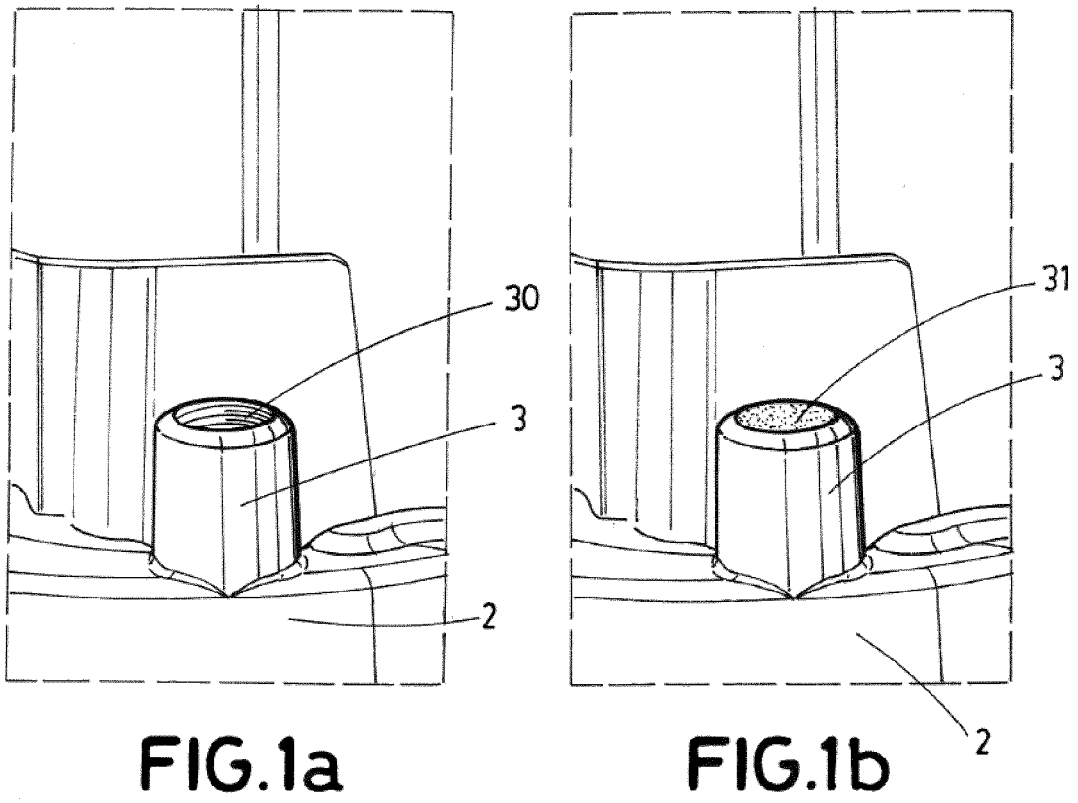
mains connected to the matching connector 6 and is free to be moved by the mechanical connector 8 when required, since the mechanical connector 8 is coupled to the aiming system 21 of the housing.

[0047] As may be seen in this figure, the hollow protrusion is a through hole so that it is accessible from both sides, and the step of screwing the auxiliary element is made from the side opposite from the connection between the auxiliary element and the connector receptacle.

[0048] In the method which is according to the embodiment shown in figure 1b, this final step would comprise the step of introducing the auxiliary element inside the hollow protrusion by a force which overcomes the resistance and moves the auxiliary element inside the hollow protrusion so that the matching connector exits from the connector receptacle.

Claims

1. Method for manufacturing an automotive luminous device 1, the method comprising the steps of providing a housing (2) with a hollow protrusion (3); providing an auxiliary element (4) in the hollow protrusion (3); providing a connector receptacle (5) in connection with the auxiliary element (4), so that the connector receptacle (5) has a rotational degree of freedom with respect to the auxiliary element (4), but has no linear degree of freedom with respect to the auxiliary element (4); inserting a matching connector (6) in the connector receptacle (5) in a detachable way, the matching connector (6) further comprising guiding means (63); placing a luminous module (7) comprising a module connector (71), the module connector (71) being helped by the guiding means (63) to be connected to the matching connector (6), thus achieving an electric connection between the module connector (71) and the matching connector (6); moving the connector receptacle (5) so that the matching connector (6) exits from the connector receptacle (5).
2. Method according to claim 1, wherein the luminous module (7) further comprises a mechanical connector which is connected to the housing while the module connector (71) is connected to the matching connector (6).
3. Method according to any of claims 1 or 2, wherein the luminous module (7) further comprises a further mechanical connector (8) which is connected to an aiming system (21) of the housing (2) while the module connector (71) is connected to the matching connector (6).
4. Method according to any of the preceding claims, wherein the hollow protrusion (3) is internally threaded, and the step of moving the connector receptacle (5) includes screwing the auxiliary element (4) into the hollow protrusion (3), so that the connector receptacle (5) moves away from the matching connector (6).
5. Method according to claim 4, wherein the hollow protrusion (3) is a through hole so that it is accessible from both sides, and the step of screwing the auxiliary element is made from the side opposite from the connection between the auxiliary element (4) and the connector receptacle (5).
6. Method according to any of claims 1 to 3, wherein the hollow protrusion (3) is configured to allow the displacement of the auxiliary element (4) inside the hollow protrusion but offering resistance to the movement, so that the resistance keeps the auxiliary element in place until the step of moving the connector receptacle (5), when an external force overcomes the resistance and moves the auxiliary element (4) inside the hollow protrusion (3) so that the matching connector (6) exits from the connector receptacle (5).
7. Method according to any of the preceding claims, wherein the auxiliary element (4) and the connector receptacle (5) comprise a ball joint (41) and a ball socket (51), so that the connection between the auxiliary element (4) and the connector receptacle (5) has a rotational degree of freedom.
8. Method according to any of the preceding claims, wherein the matching connector (6) comprises a first region (61) intended to cooperate with the connector receptacle and a second region (62) comprising the guiding means (63), and the first region (61) of the matching connector (6) and the connector receptacle (5) comprise a rectangular protrusion (64) and a rectangular housing (53), so that the insertion between the matching connector (6) and the connector receptacle (5) may only be assembled and disassembled in a single direction.
9. Method according to claim 8, wherein the rectangular housing comprises a recess (52) for connecting cables (60) from the matching connector (6) to pass.
10. Method according to any of the preceding claims, wherein the guiding means comprise a funnel shaped guide (63) adapted to guide the module connector (71) towards the matching connector (6).



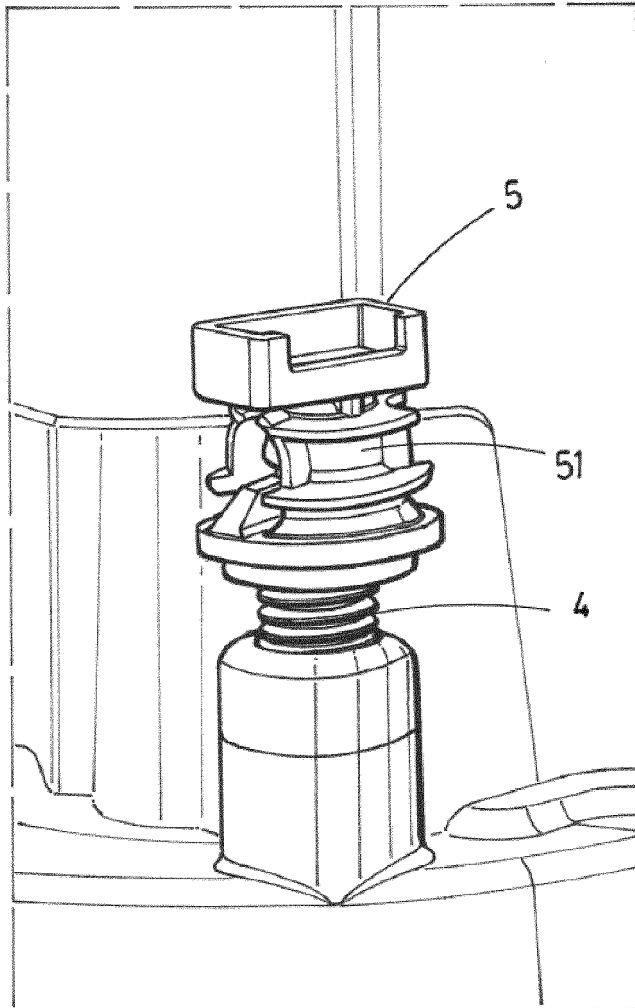


FIG. 3

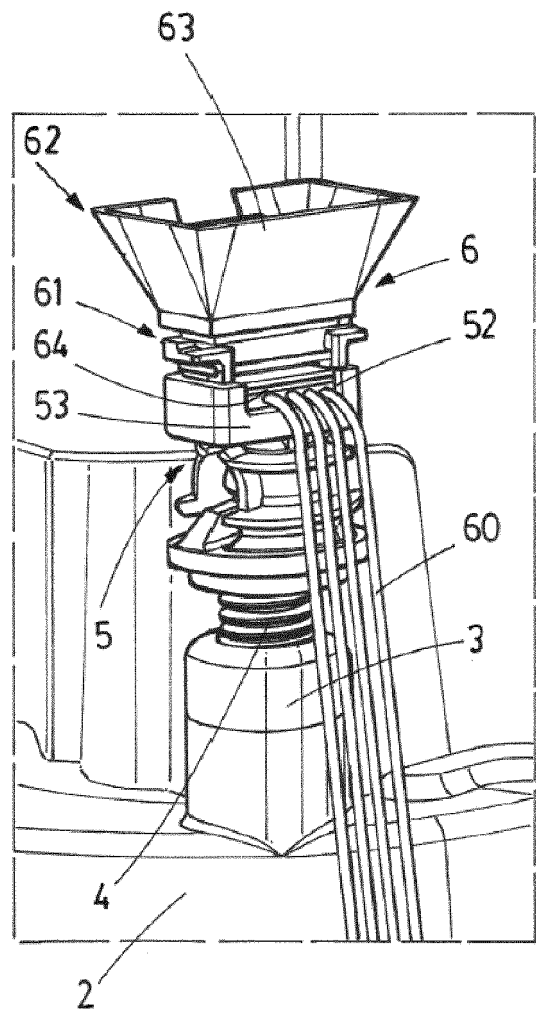


FIG. 4

FIG.5

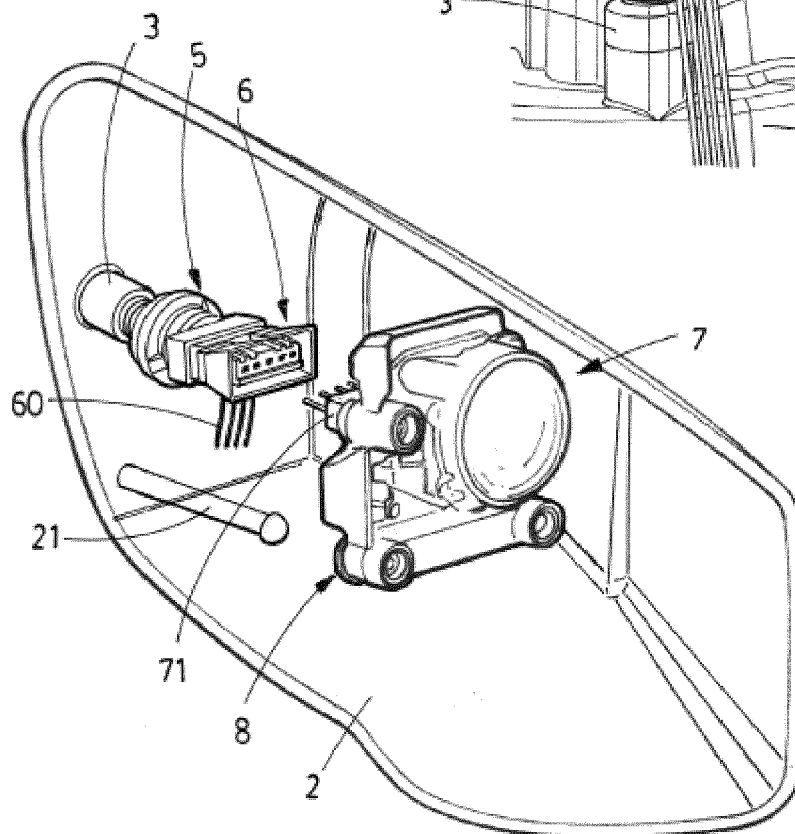
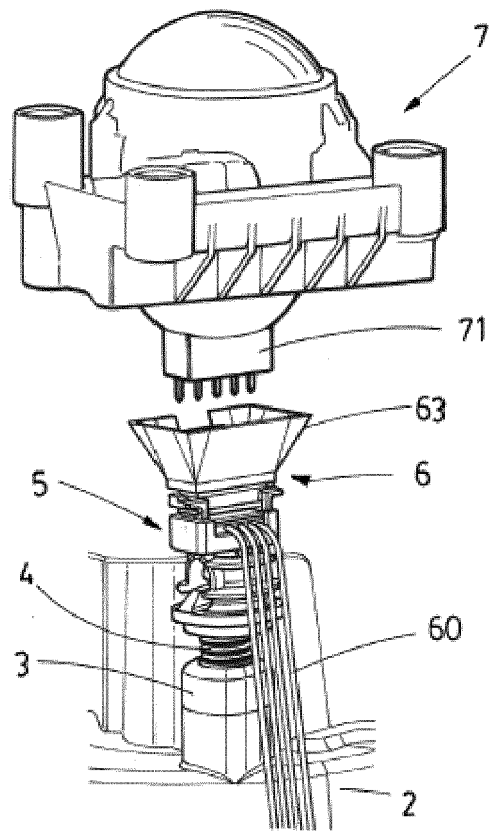


FIG.6

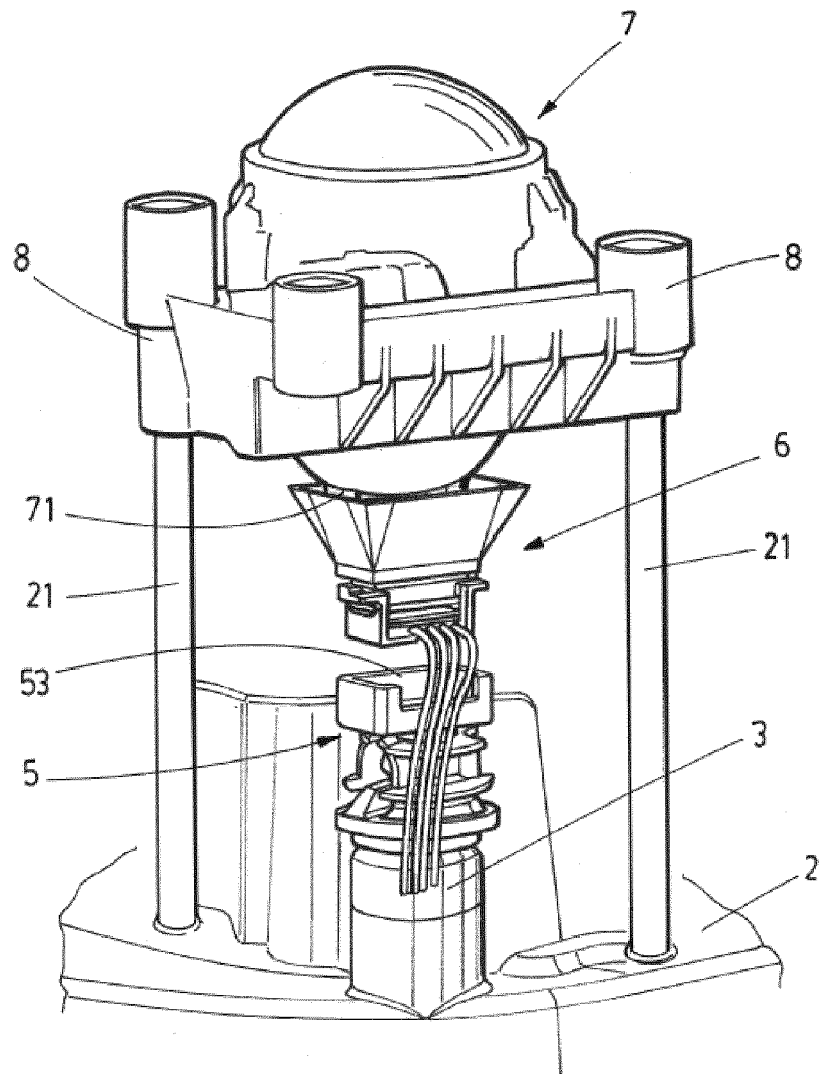


FIG.7



EUROPEAN SEARCH REPORT

 Application Number
 EP 18 38 2575

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	FR 3 010 771 A1 (VALEO VISION [FR]) 20 March 2015 (2015-03-20) * page 6, line 22 - page 9, line 3; figures 3,4 *	1-10	INV. F21S45/00 ADD. B60Q1/00
A	JP 2014 146465 A (KOITO MFG CO LTD) 14 August 2014 (2014-08-14) * see attached machine translation; paragraphs [0001], [0007], [0048] - [0052], [0080] - [0088]; figures 1-6 *	1-3,6-9	
A	CN 204 488 626 U (TIANJIN STANLEY ELECTRIC CO LTD) 22 July 2015 (2015-07-22) * see attached machine translation; figures 1-5 *	1,3-6	
A	KR 2002 0088136 A (HYUNDAI MOTOR CO LTD [KR]) 27 November 2002 (2002-11-27) * see attached machine translation; figures 1,2 *	1,4-6	
A	DE 196 07 798 A1 (VOLKSWAGEN AG [DE]) 5 September 1996 (1996-09-05) * column 3, line 37 - column 4, line 50; figures 1-8 *	1-3	TECHNICAL FIELDS SEARCHED (IPC) F21S B60Q B60R H01R H01B B29C
A	DE 10 2015 215696 A1 (KOITO MFG CO LTD [JP]) 18 February 2016 (2016-02-18) * paragraphs [0025] - [0059]; figures 1-11 *	1-3	
A	US 2009/257819 A1 (BURTON JOHN [US]) 15 October 2009 (2009-10-15) * paragraphs [0056] - [0058]; figures 1-20 *	1-3	
		-/--	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 20 November 2018	Examiner Goltes, Matjaz
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)



EUROPEAN SEARCH REPORT

Application Number
EP 18 38 2575

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2013/219694 A1 (OVENSHERE JAY H [US]) 29 August 2013 (2013-08-29) * paragraphs [0001], [0019] - [0050]; figures 1-5 * -----	1	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 20 November 2018	Examiner Goltes, Matjaz
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 18 38 2575

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

20-11-2018

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 3010771 A1	20-03-2015	NONE	
JP 2014146465 A	14-08-2014	JP 6176931 B2 JP 2014146465 A	09-08-2017 14-08-2014
CN 204488626 U	22-07-2015	NONE	
KR 20020088136 A	27-11-2002	NONE	
DE 19607798 A1	05-09-1996	NONE	
DE 102015215696 A1	18-02-2016	DE 102015215696 A1 FR 3024897 A1 JP 2016042428 A US 2016047519 A1 US 2018119913 A1	18-02-2016 19-02-2016 31-03-2016 18-02-2016 03-05-2018
US 2009257819 A1	15-10-2009	NONE	
US 2013219694 A1	29-08-2013	CN 103286735 A DE 102013202637 A1 US 2013219694 A1	11-09-2013 29-08-2013 29-08-2013

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82